## WHAT IS CLAIMED IS:

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| 1.     | A method for real time determination the of mineral scale deposition rate from |
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| a form | nation fluid comprising:   |
|        | A) placing an optical probe having a probe surface which can measure           |
|        | changes in refractive index at the probe surface, into contact with a          |
|        | formation fluid produced or being produced from an oil well;                   |
|        | B) measuring the changes in refractive index at the probe surface; and         |
|        | C) determining the on-set and rate, if any, of mineral scale deposition from   |
|        | the formation fluid as a function of the changes in refractive index at the    |
|        | probe surface;   |
| where  | ein:   |
|        | i) the probe surface which can be monitored for changes in refractive index is |
|        | in contact with the formation fluid;   |
|        | ii) the probe, including the probe surface which can be monitored for changes  |
|        | in refractive index, is composed of a material which can withstand an          |
|        | extended period of contact with the formation fluid at the temperatures and    |
|        | pressures present in oil wells; and  |
|        | iii) the determination of on-set of mineral scale deposition and the mineral   |
|        | scale deposition rate from the formation fluid takes place in real time.       |
|        |  |
| 2.     | The method of Claim 1 wherein the optical probe having a probe surface         |
| which  | can measure changes in refractive index at the probe surface is an ATR         |
| probe  |  |

- 1 3. The method of Claim 2 wherein the ATR probe includes a means of
- 2 measuring the refractive index change associated with a material in contact with the
- 3 probe which is a photometer.

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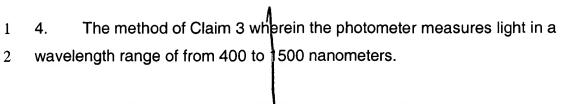
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- The method of Claim 4 wherein the photometer measures light in a wavelength range of from 500 to 700 nanometers.
- 1 6. The method of Claim 5 wherein the photometer measures light in a wavelength range of from 630 to 690 nanometers.
- 7. The method of Claim 4 wherein the photometer measures light in a wavelength range of from 800 to 900 nanometers.
- 1 8. The method of Claim 7 wherein the photometer measures light in a wavelength range of from 850 to 900 nanometers.
- 9. The method of Claim 8 wherein the photometer measures light in a wavelength range of from 870 to 890 nanometers.
- 1 10. The method of Claim 1 additionally comprising using an automated probe 2 cleaning device to clean, calibrate, insert and extract the probe surface.
  - 11. A method for controlling mineral scale deposition from a formation fluid comprising:
    - A) placing an optical probe having a probe surface which can measure changes in refractive index at the probe surface, into contact with a formation fluid produced or being produced from an oil well;
  - B) measuring the changes in refractive index at the probe surface;
- C) determining the on-set and rate, if any, of mineral scale deposition from the formation fluid as a function of the changes in refractive index at the probe surface;

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| 10 | D)       | comparing the rate, if any, of mineral scale deposition, to a predetermined        |
|----|----------|--|
| 11 |          | range of acceptable mineral scale deposition; and                                  |
| 12 | E)       | effecting a change in the rate of addition, if any, to the formation fluid of an   |
| 13 |          | additive effective for preventing mineral scale deposition from a formation        |
| 14 |          | fluid ;  |
| 15 | wherein: |  |
| 16 | i)       | the probe surface which can be monitored for changes in refractive index is        |
| 17 |          | in contact with the formation fluid;   |
| 18 | ii)      | the probe, including the probe surface which can be monitored for changes          |
| 19 |          | in refractive index, is composed of a material which can withstand an              |
| 20 |          | extended period of contact with the formation fluid at the temperatures and        |
| 21 |          | pressures present in oil wells;  |
| 22 | iii)     | the determination of the mineral scale deposition rate from the formation          |
| 23 |          | fluid takes place in real time; and  |
| 24 | iv)      | the rate of addition, if any, to the formation fluid of the additive effective for |
| 25 |          | preventing mineral scale deposition from a formation fluid is:                     |
| 26 |          | (1) increased when on-set of mineral scale deposition is detected or               |
| 27 |          | the mineral scale deposition rate is greater than the range of                     |
| 28 |          | acceptable mineral scale deposition;   |
| 29 |          | (2) decreased when no mineral scale deposition is detected or the                  |
| 30 |          | mineral scale deposition rate is less than the range of acceptable                 |
| 31 |          | mineral scale deposition; and  |
| 32 |          | (3) unchanged when no mineral scale deposition is detected or the                  |
| 33 |          | mineral scale rate deposition is within the range of acceptable                    |
| 34 |          | mineral scale deposition.  |
|    |          |  |
| 1  | 12. Th   | ne method of Claim 11 wherein the optical probe having a probe surface             |

1 12. The method of Claim 11 wherein the optical probe having a probe surface which can measure changes in refractive index at the probe surface is an ATR probe.



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- 2 measuring the refractance of a material in contact with the probe which is a
- 3 photometer.
- 1 14. The method of Claim 13 wherein the photometer measures light in a
- wavelength range of from 400 to \$1500 nanometers.
- 1 15. The method of Claim 14 wherein the photometer measures light in a
- wavelength range of from 500 to 700 nanometers.
- 1 16. The method of Claim 15 wherein the photometer measures light in a
- wavelength range of from 630 to 690 nanometers.
- 1 17. The method of Claim 14 wherein the photometer measures light in a
- 2 wavelength range of from 800 to 900 nanometers.
- 1 18. The method of Claim 17 wherein the photometer measures light in a
- wavelength range of from 850 to 900 nanometers.
- 1 19. The method of Claim 18 wherein the photometer measures light in a
- wavelength range of from 870 to 890 nanometers.
- 1 20. The method of Claim 11 additionally comprising using an automated probe
- cleaning device to clean, calibrate, extract and insert the probe surface.
- 1 21. A system for controlling mineral scale deposition from a formation fluid
- 2 comprising a fluid flow path for flowing formation fluid recovered from a subsurface
- formation; an optical probe having a probe surface which can measure changes in
- 4 refractive index at the probe surface associated with the formation fluid in the fluid
- flow path providing data corresponding to the rate of deposition of mineral scale from

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the formation fluid in the fluid flow path; and a processor for determining from the data the rate of deposition of mineral scale from the formation fluid.

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